

AVIATION

The Oldest American Aeronautical Magazine

July 28, 1928

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The new Wasp powered Sikorsky S-38 amphibian taking off.

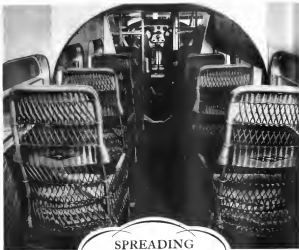
VOLUME
XXV

Special Features

The Bird Biplane
The Sikorsky S-38
Keystone Production

NUMBER
5

AVIATION PUBLISHING CORPORATION
250 WEST 57TH STREET, NEW YORK



SPREADING YOUR COSTS THIN

Did you read the bulletin issued by the Aeronautics Branch of the Department of Commerce, dated April 18th, discussing aircraft operation costs? There's much food for thought in it.

For example, two operators of single-engined, two-passenger planes nearly agree on costs, one giving a figure of 34 cents per plane mile, the other 37 cents. These show a cost per mile per passenger of about 17 cents, which the passenger must pay, of course.

The high cost is the passenger of flying from here to there is one of the chief reasons more people do not fly. Bringing down the cost is one of the quickest ways to increase business. There's no room for doubt about this.

Getting that even perfect management can't bring plane-mile costs down, there still is a way to bring down the cost to the passenger. And that's by spreading the cost over more people.

The same government bulletin gives a cost of 91.35 per mile for two-passenger planes. Higher than

single-engined, naturally. But the Ford trimotor transport spreads the cost over twelve passengers, bringing the charge on each individual down to 9.8 cents per mile. Quite a reduction! Almost double railroad fare plus Pullman. And more than twice the speed!

Chances like that will fill your planes. Think it over. Small shops may be holding your transport service back because your service must be loaded to those who can pay extravagant fares. Every cent-per-mile you can cut your charges makes more customers for you.

We'll be glad to tell you anything we can about the cost of operating Ford trimotors, all-metal transports. Write to

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Division of
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Dearborn, Michigan

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AVIATION

The Oldest American Aeronautical Magazine

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EDWARD F. POWELL, Book Editor
DAVID J. LEAKE, Art Editor
ALBERT F. MULLANY, Art Director

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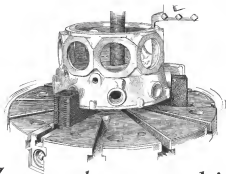
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Two weeks to machine a crankcase section~

ALUMINUM, known for the stress it plays in process, is most sensitive to the treatment of curing molds, yet most essential to the lightness of a fine aircraft engine. It resists against its molded shapes; it swells from heat generated in machining. One section will warp in position at the treatment given another.

Two weeks go by before a crankcase casting is fully machined ready to be assembled in an engine. Two weeks—the time necessary for machining alone but time which Wright engineers know should be allowed for adjustment of the metal between successive operations. These men know their metal—know its peculiarities of stress and strain—its tendency to warp and

run out of shape under the heat generated by curing molds. Each man knows how much the part he makes will swell before expanding—knows how much heat such cast involves—knows when to stop before warping begins. He will machine one part, then jump to another. He knows when a casting needs a "cure", and sets it aside for two days, or even three, before machining again.

By such careful procedure, Wright Crankcases are brought into shape without stress, resented strain and lighter with an surplus of strength; workable when they appear where the finished pieces

worthy of being called the "finest aluminum casting made."

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Aircraft
Engine



The Oldest American Aeronautical Magazine

Vol. XXV

JULY 25, 1925

No. 5

Propaganda in the North

THE LONG drawn out tragedy which has been going on in the Arctic will be continued when Nohia and the remnants of his party return to face the consequences of Europe. The flight of the *Italia*, unlike most other flights in the North, was backed unofficially by the government and there is little doubt that the primary object was propaganda rather than scientific research. In the final analysis this should not give our admirers of the daring and courage required to make the flight, but there is no doubt but that it does effect our feelings toward the enterprise. In the same way we admire unconsciously the cooperation and bravery of Chukchevsky and the crew of the *Komov*. The way in which they accomplished the venture could not have been surpassed for devotion and selflessness but the manner in which the Russian government and press exploited the episode and attacked the Italians took away all the spontaneity of the episode. One can not help but feel that a fine deed should stand by itself and that it is spoiled if used for propaganda purposes.

Amundsen's flight to rescue his most hated enemy stands out as the brightest spot in this tragedy where noble deeds have been sullied by their use for propaganda purposes. Amundsen realized perhaps better than anyone else the risk he was taking in flying through the sudden fog which prevailed in the North at this time of year, yet he willingly went to the help of a man with whom he had quarreled most bitterly.

A Tour for Private Pilots

IN SPITE of unfavorable conditions as regards the design of planes and their maintenance, private flying is rapidly becoming popular in this country. The flying club idea is spreading and two seater planes with suitable engines are now available. It is to be hoped that by last next year private flyers will be a substantial part of the aeronautical community.

It is essential to the industry that this class be encouraged, for if planes are to be used only for business purposes the field of aeronautics will be considerably limited. Perhaps one of the best ways to afford recognition to general flyers and to encourage further development would be to organize a tour somewhat similar to the first National Reliability Tour, but to permit only non-professional pilots to participate. The range of such a tour should not be too long or too difficult. It might

be made through the scenery of the Mississippi Valley. As in the first National Reliability Tour there should be no special award for distant weather and the necessity of the planes should not be the most important feature. However, some sort of competition might be introduced by appointing a committee which would judge the accuracy of the landings and the smoothness of the take-offs. In view of the fact that flying is to a considerable extent a social activity in the type of men and women which it attracts the participants in a private pilot's tour should be most congenial with each other. They would have much in common about which they could talk and from the right side the tour should prove to be most pleasant. As there would be no prize money necessary a private pilot's tour should not be very expensive to its organizers and it would certainly be a stimulus to private flyers.

Self Starters

UNDOUBTEDLY ONE of the greatest factors in the popularizing of automobiles was the introduction of the self starter. Cranking was a nuisance and dangerous even for strong men, and it practically eliminated women from the driving. If self starters made a difference in the popularity of automobiles they certainly will make a much greater difference with airplanes and their high powered engines. Having a prop by hand is hard work; requires considerable skill, and, to put it mildly, is not a pastime in which most of us like to indulge.

At present, hand cranks are fitted to most of the new commercial engines but if airplanes are to be handled by women and amateurs they should have every convenience, and self starters which are so easy to operate as those on automobiles will be required. The starter should certainly be workable from the cabin for otherwise it really takes two people to start the plane. The unfortunate part is that the planes which amateurs fly are usually of small size and in such planes every ounce of weight counts and to date most of the starter development has been done for larger engines and especially the really large ones which are nearly impossible to start by hand. The progressive manufacturer of small engines would be making a great step forward if he should fit all his engines with self starters. This would give the starter manufacturer a real basis upon which to start development and production, and it would not be a long while before all buyers of engines demanded that self starters be fitted as regular accessories.

Keystone Production

Modern Methods and Equipment Enable the Keystone Aircraft Corp. to Manufacture a Quality Product on Schedule

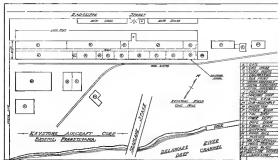
BY C. L. ROLANDSON

Vice-President and Works Manager, Keystone Aircraft Corp.

THE Keystone Aircraft Corp. is located midway between New York City and Philadelphia, at Bristol, Pa., on the main line of the Pennsylvania Railroad and on the deep waterways of the Delaware River, offering excellent shipping facilities all over the world by flying away, shipping by rail, or by barge to Philadelphia or New York City.

Bristol is a city of 15,000 inhabitants with pleasant homes, clean streets, and is an ideal place for employees to own their own homes, or rent, as they choose. Therefore the cost of living is reduced below that in almost any other city in the East that can boast of a large aircraft factory. The plant is within easy walking distance of any location in the city one might choose.

The plant is located on a plot of 25 acres, has 2,200 ft. frontage on the Delaware River, ship docks, and consists of 140,000 sq. ft. of floor space. The main building is 1,000 ft. x 100 ft. Other smaller buildings are for lumber storage, dry kiln, wood mill, blacksmith shop, heat treating, plating and the engineering department. The buildings are modern in every respect, with plenty of light, clean, and with an excellent sprinkler system for fire protection in every building.



Keyst. drawing showing the general layout of the Keystone Aircraft Corp.

All machinery is properly protected as a Safety-First measure for our employees. The equipment is all practically new. This alone makes for extreme economy and speedy production.

The flying field is within an mile of the factory, covering 180 acres, with a spacious hangar and day and night service facilities. The location of the factory adapts itself to water craft and a concrete runway has been installed for such landing, making it ideal for the testing of airplanes.

The main building, 1,000 ft. x 100 sq. ft. of floor space has been divided longitudinally by an aisle wide enough to move materials and assemblies in a progressive manner, and to allow motor trucks or fire apparatus to ply the entire length of the factory.

Outside of the main building, at one end, is the Engineering Department, with a floor space of approximately 4,000 ft. It is thoroughly equipped with modern aircraft engineering facilities, necessary for rapid production of designs and the carrying on of research work. Laboratory facilities are available for perfecting the design and producing working drawings of airplane parts that are strong, yet light in weight—always bearing in mind ap-

pearance and quality. C. T. Porter is Chief Engineer directly in charge of Engineering and "Midge" Malloy is his chief assistant.

The engineering point of contact with the Manufacturing Department is through a clearing house known as the Factory Planning Department, which is under the supervision of the Materials Supervisor, Charles W. Miller. His duties are to coordinate all engineering policies, blueprint, change orders, bills of materials, request release quantities through the buyer, and receive materials into stores—where a perpetual inventory is kept, separate



Air view of the Keystone factory showing the flying field and airplane hangars.

from the Stores Managers, which are headed by the Accounting Department. The Factory Planning Department also has charge of Shop Orders, the routing of work and materials through the various operations in each department, and finally turning out a complete airplane from our Shipping Department, either by rail or by air from our flying field.

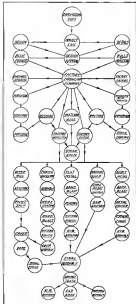
Materials coming into the Receiving Room pass through the hands of the receiving clerk, who counts, measures, or weighs the material for a thorough check with the shipping ticket. Copies of this receiving record then pass to Inspection, to Planning, and to Purchasing Departments, for a check with the purchase order, and finally to the Accounting Department for payment of the invoice.

Materials Marked for Identification

When the materials arrive in stores they are properly marked for identification and placed in bins, or sections—depending upon the size and shape of the material. Before marking, however, the Inspection Department thoroughly inspects the material and takes specimens for test, so as to be sure that all materials meet the specifications. Consequently, no material goes into stores that does not meet specifications, and there is no chance of material not approved ever becoming a part of one of our airplanes.

The Inspection Department is managed by Horace Hinch who, with his able assistants, are constantly watching the factory watching for errors, when they are not actually inspecting a particular part of a plane. It is estimated that each part of an airplane undergoes the scrutiny of inspection at least seven times before it finds its way, finally into one of the finished airplanes.

In a separate building, at the end and opposite from the Engineering Department, is the Wood Mill, where the fabrication of small wood parts is carried on. This is a two-story building occupying 10,000 sq. ft. of floor space, a part of which is a board lumber storage assembly large for the storage—when properly rickled—of 60,000 ft. of



General production route.

straight lumber. Adjoining this building is the dry kiln with all the usual necessary for drying straight wood materials to meet specifications. This device-gas eliminates all dirt and dirt from the main factory and carries it to the Mill building, which is fitted with the usual dust collectors for mills of this type.

In the end of the yard, and in a separate building, is the Sand Blast Room, and in another building the Heat Treating and Plating Rooms are located—these eliminating all chances of rust, acid, and moisture injuring the airplane parts in fabrication. These departments are adjacent to the Metal Department, located in the main building.

(Continued on page 330)

The Sikorsky S-38

*New Amphibian Powered With Two Pratt & Whitney "Wasp" Engines
Has a High Speed of 129.5 M. P. H.*

By LESLIE E. NEVILLE

WHAT is believed to be the largest, most powerful and fastest plane of its kind in the United States, it is not in the shape world, is the new Type S-38 twin engined amphibian recently completed by the Sikorsky Manufacturing Corp., College Point, L. I., for Pan American Airways, Inc., to be used on the proposed international line connecting Key West, The Azores and Central Australia. The new plane is similar in many respects to the S-36 Type, which included "The Diver" used by the late Mrs. Frances Grayson in her unsuccessful attempt to fly across the Atlantic. The later model, however, embodied several outstanding improvements in design.

To provide adequate reserve power in cases lacking in amphibians, two Pratt & Whitney "Wasp" engines, developing 600 hp. at 1900 r.p.m., are installed. Future plans of this type are planned to be powered with Wright "Cyclone" and Pratt & Whitney "Blazer" engines. This change can be made by a simple modification of the system of struts supporting the engine mountings.

The S-38 has an upper wing span of 77 ft. 6 in. and an overall length of 35 ft. 10 in. Its weight empty is 5800 lb. and it is designed to carry a useful load of 3000 lb. An allowance of 4500 lb. was made, however, by the Department of Commerce after checking the stress analysis presented. The plane accommodates nine passengers and a crew of two but additional folding chairs are provided bringing the total seating capacity up to 15 or more persons including pilot and crewmen.

In all of its tests the S-38 has exceeded the performance predicted by its designers and has given proof of remarkable flying characteristics. Its quick take off, high speed, high ceiling, low landing speed and exceptional maneuverability mark it as a better

in this class. In official Navy tests conducted at Washington by Igor I. Sikorsky and Lt. J. W. Hale the S-38 attained a high speed of 129.5 m.p.h. and an altitude of 20,000 ft. with full useful load of 3000 lb. This is believed to be the highest speed and altitude thus far attained by any amphibian. The plane with the same



Interior view of the cabin of the new twin engine Sikorsky S-38.

load took off from fresh water in 14 sec. and landed at a speed under 32 m.p.h. At 2000 ft. one engine was stopped and the plane glided altitude with only the remaining engine in operation. In the high speed test the engines were turning at 1900 r.p.m. and it is expected that a still higher speed can be obtained.

The S-38 may be called a seaplane, the lower wing being relatively short and included easily for



Front quarter view of the new Sikorsky S-38 amphibian (two Pratt & Whitney "Wasp").



Action picture of the twin engined (Wasp) Sikorsky S-38 sailing on the water.

structural purposes. This design feature combines the good aerodynamic qualities of the monoplane with the structural advantages of the biplane. In general the plane consists of a very rigid and maneuvering boat, to which the panels of the lower wing are attached, and two entirely separate light damage outriggers connecting the upper wing with the tail surfaces and supported near the rear by two struts mounted on the stern of the boat. The hull and engine area are located as separate aerodynamic units and neither impairs the efficiency of the other. This arrangement also increases to a maximum the efficiency of the two balanced rotors by permitting them to be placed directly in the slipstreams of the engines which are suspended from the upper wing on each side of the vertical center line of the plane. The high position of the tail surfaces protects them from damage in maneuvering on the water. Side floats are suspended from the lower wing panels and are closer to the hull than is conventional in flying boat design. These location and the carefully worked out shape of the hull bottom are contributing factors in the elimination of spray at the take off.

Wings, outriggers and tail surfaces are orange in color and hull and side floats are painted battleship gray. Orange stripes mark the outlines of hull and side floats, all of which are painted on the bottom with a black antifouling preparation to resist the action of salt water. Fuel and passenger cabins are of duralumin and engine casings are silver in color.

The hull structure is entirely of hardened as-cast duralumin plates, providing greater strength and rigidity than all metal construction. This framework is sheathed with "Alclad" aluminum duralumin sheets pressed together and fastened by wood screws to the framework. All areas are sealed with airplane fabric and marine glue. Side floats are of similar construction. The hull is divided by bulkheads into six water-tight compartments serving as flotation in the event of landing on one or more of these compartments. Bulkheads in the wing floats divide each of them into two watertight compartments making a total of 10 independent flotation units and reducing the possibility of sinking to a minimum. The hull is of single step construction, with a 17 deg. V bottom. It is 30 ft. in length and has a maximum beam of 62 in. Large spoilers on each side

give it a maximum bottom surface width of 82 in. The total displacement of the hull is 24,500 lb. and its weight without floor and deck is 700 lb.

Each section of the boat is entered through a watertight hatch in the deck. The extreme forward compartment is used for storage of ground tackle and



I. I. Sikorsky and M. G. Goulet in front of the Sikorsky S-38.

other equipment and is sufficiently large to accommodate use of the crew while anchoring or mooring the plane. Aft of this is a mail or baggage compartment of 52 cu. ft. capacity, accessible through a hatch in the deck or a door in the bulkhead which separates it from the cabin. The third section is the passengers' cabin with the pilots' compartment in the forward end. A second baggage compartment is the stern of the boat containing the fourth longitudinal section of the hull. The space under the cabin floor which is watertight, is divided into two remaining compartments. The passengers' cabin is 9 ft. 3 in. long, 3 ft. wide and 5 ft. in high and has a capacity of 275 cu. ft. Nine window chairs are provided and are fastened to the floor by turnbuckles making them easily removable to change the interior arrangement. Each chair has a rack underneath containing a life jacket. Ceiling and side walls are finished in gray artificial leather with mahogany plywood trim on the side walls and the duralumin deck supports serving as trim for the ceiling. (Continued on page 344)

The Bird Biplane

A Three Place Open Cockpit Biplane Made by Brunner & Winkle Aircraft Corp. and Powered With an OX-5 Engine

PRODUCTION is being started on the first planes of the Brunner & Winkle Aircraft Corp., Glendale, Cal., N. Y. An experimental model is already complete and has been flying for some time. The "Bird" biplane is a very efficient open cockpit design, following conventional construction, through incorporating many interesting features. The design was worked out by M. Gieger, consulting aeronautical engineer, New York City.

The Brunner & Winkle Aircraft Corp. who has obtained a factory with 35,000 sq. ft. of floor space in Glendale. Many new jobs are already complete and it is expected that the first production model will be in the air during July. William E. Winkle, a lieutenant in the Army Air Corps during the War and has been flying since that time. J. Brunner has had considerable experience in the automobile field and is planning to apply it to his aircraft activities.

The Bird is an open cockpit, three place biplane of very clean design, powered with a Curtiss OX-5 engine, though it is understood that 80 and 120 hp. engines will be standard equipment on this plane. The plane may be called a seaplane, as the upper wing has a much larger span than that of the lower wing. The wings are made from the front point outward, giving them the appearance of a taper, and because of their great stagger and also because of the twisted type of radiator, the plane has the appearance of a giant diver. It has silver colored wings and tail surfaces, with a clever silver fuselage. Through a load factor of 6½ for high incidence in re-

quired by the Department of Commerce for a plane of this type, it is stated that it was designed with a load factor of 8 and that by very careful engineering the weights have been kept down. Empty the plane weighs



Rear view of the Bird Biplane

550 lb.; with a disposal load of 800 lb., it has a gross weight of 1775 lb.

The upper wing has a 34 ft. span, while that of the lower wing is 25 ft., mounting the streamlined inter-plane struts to have an outward slope. The modified U.S.A. 40-11 airfoil is employed, and according to the designer, great care was taken to prevent twisting in the wings, which are of fairly thick section. Only single wire internal bracing is used in the center line of the deck.

(Continued on page 348)



Side view of the Bird Biplane (OX-5) manufactured by Brunner & Winkle Aircraft Corp.

The National Air Tour

Unsettled Weather Causes Slight Change in Tacoma to Spokane Route and All Entries Check In at Vancouver

By JOHN T. NEVILL

Aviation Correspondent on the Tour

THE second half of the Tour did not have an auspicious beginning. The pilots awoke on the morning of July 16 in San Francisco to find a thick fog hanging over the entire bay and extending far out to sea. The coast previously all of the expanse to cross the bay, either under or over the fog to Oakland, then to continue inland in a northeasterly direction to the Sacramento River valley and follow the valley to Corning, a city 165 miles north of San Francisco is an arduous task.

With cessation of her forest landing on the road at Laguna Beach, between San Diego and Los Angeles still



Richard Pears (left) pilot of the Fairchild entry No. 24, and Ray Collier flying manager of the Tour

fresh in her mind, Mrs. Oude decided to remain at Hills Field until weather conditions improved. Jack Adams, pilot of Monocoupe number 25, who had arrived in San Francisco on the previous night with Monocoupe 20, which Mrs. Oude had ground looped in Merils, Texas, remained on the field with her. Entry number 5, the Curtiss Robin, piloted by Robinson, was kept at the start-up point by a broken propeller. The remaining entries began taking off at 8 A. M. for Corning, the first of three legs scheduled in the day's flying, the three of them comprising the longest day's mileage on the entire tour route.

All of the planes, save the three that remained on the field for a later take off, registered perfect scores over the San Francisco-Corning leg. In Corning the planes landed at Woodson field in the late afternoon, and the seaplanes were treated to refreshments on the field. Shortly before noon they began making off again on the second leg of the day, a 100 mile flight to Modford, Ore. On this leg the planes plunged into the real mountain country of Shasta and Shasta counties, Calif., maintaining altitudes from 4,000 to 9,000 ft., landing on the majestic Mount Shasta, and following the air mail trail to the Pacific northwest. Ahead of the snow-laden Shasta, rising gradually 14,380 ft. into the air, the four planes turned northwesterly, passed near the eastern end of the Shasta range, and an area Oregon. They came to rest in Modford on the Nevada

Barber field only in the afternoon, all of the planes, save numbers 20, 29 and 5 making perfect scores on the leg. Landing was served the two personnel over the airport.

The Nevada Barber field proved much too small and not much to suit the pilots of the large and heavier planes, some of them experiencing considerable difficulty in taking off. Immediately after the luncheon the flight to Portland began, the planes taking off in the order of arrival, a column earned out at and day stops.

On the leg to Portland from Modford the pilots were faced with the problem of climbing to a very high altitude within a few miles after taking off in order to clear the lofty peaks directly across their course. An alternate valley route, however, proved to be more to suit of Roubidoux, which approximately half of the planes chose. The other half winged their way directly over the mountains. Despite the handicap of the lengthened mileage only one entry, Travel Air, number three, failed to make Portland on scheduled time, after leaving Modford on schedule time. Numbers 20, 29, and 5 were late into and out of Modford, number 28, a Waco, piloted by Gould Beard, was delayed on the Modford field with a broken crank case, and number 5, a Ryan, flown by Eddie Cleveland, was held up on the same field by stormer trouble.

With their arrival on the Swan Island airport, Portland, the planes had covered 229 mi. from Modford and a total of 553 airfield miles since leaving San Francisco in the morning. Practically all of the route between Corning



Jack Adams (right) who is piloting the Buell entry No. 6

and Portland presented the aerial tourists with a sublime birdseye view of the Pacific West's magnificent mountains and timberlands. Glorious views of snow-capped peaks, dark wooded slopes and the deepest canyons, beautiful to gaze down upon allowing few clearings where an airplane might be safely landed.

The two tiny Monocoupe baby planes of the tour, and Cleveland's Ryan, negotiated the peaks and passes along Oregon. They came to rest in Modford on the Nevada

(Continued on page 341)

THE BUYER'S LOG BOOK

Airspeed Indicator

THE CONSOLIDATED airspeed indicator, a product of the Consolidated Instrument Co. of Astoria, New York, and the Aircraft Control Corp. of Philadelphia, is the first airspeed instrument which is furnished with a molded bakelite case. It is never factored in a smaller size than the standard type. The new airspeed indicator incorporates the same movement as the larger type, which has been used for every year in the Army and Navy Air Service instruments.

The total weight of the instrument is only 8 oz. and 2½" diameter dial renders maximum visibility within available space. The small dial instrument is intended for hours, or in case instrument have to be installed within limited vision. The introduction of small dial instruments is not to replace the regular instruments of 3-11/16" dial.

Development is being carried on to have tachometer, altimeter fuel gauge and turn indicator be of identical mounting, thus eliminating variety in size and mountings.

Decided improvement in performance, life and appearance of airspeed instruments is expected from introduction of Bakelite molded cases. Although some instruments are already made of non-corrosive materials exclusively yet, unless proper care is exercised in the design and mounting, contact between aluminum and brass parts results in electrolytic action, affecting the performance and durability of the instruments.

Bakelite is rapidly finding new applications in most diversified fields. It is non-corrosive. Lighter than aluminum, requires no surface treatment and effectively resists wear and atmospheric conditions.

Pitch and Bank Indicator

THE Baker Instrument Co., manufacturers of airspeed instruments, 1909 Fairmount Ave., Philadelphia, Pa., is now manufacturing a combination pitch and bank indicator which is a valuable addition to the equipment of any airplane. This instrument is light in weight and made of the finest materials and according to the specifications of the U. S. Army.

The pitch and bank indicator is "T" shaped with the lateral scale on the top. It is eight in high and six in wide at the top and weighs less than three oz. The pitch indicator shows on the vertical scale the exact angle of ascent or descent, by variation in the level of the liquid whether at rest or in flight. The bank indicator has a bubble which gives a direct reading and registers on the lateral scale any departure from the correct heading angle. The vertical scale is graduated from 0 to 30 degrees in either direction and the lateral scale from 0 to 30 degrees in either direction.

Black & Decker Grinder

A COMBINATION grinder which will be found useful for sharpening all kinds of edged tools, cutting and drawing has been brought out by the Black & Decker Mfg. Co. of Towson, Md. It has a speed of



A combination Black & Decker grinder.

2800 r.p.m. and the universal motor is ball bearing mounted making for high efficiency and long life.

This grinder is furnished complete with a 5" grinding wheel on the left side of the spindle and a 6" wire wheel on the right side. The wire wheel brush is interchangeable with baffle. Besides the brush and grinding wheel equipment includes six ft. of electric cable equipped with standard attachment plug and a switch in the line, one tool rest and one guard.

Guaranteed Hangar

TO SATISFY the increasing demand for all steel fireproof hangars the Guaranteed Garage Corp., of 125 04 Jerome Ave., Birmmgham Hill, N. Y. is arranging for a national and international sales force. The steel buildings manufactured by this concern are in great demand because of their neat construction. The buildings are built entirely of steel in models having curved or gable roofs and are of rugged construction.



Drawing of a Guaranteed Garage Corp. hangar.

trusses. Walls and roof sheets are bolted to the framework and are fitted with an interlocking device to prevent leaking. The buildings are so designed that the can be tilted down and retracted with 100% salvage.

The National Air Tour

(Continued from page 335)

and landed on Swan Island late Monday afternoon. When number 28, and Currier Robin, number 8, resumed over night in Malakoff and flew into Portland on Tuesday.

The scores of the highest 15 entrants at Portland were announced as follows:

Pos.	Plane Number	Pilot	Score
1	Plane 18	Reed	212.00
2	Plane 21	Reed	186.00
3	Plane 21	Reed	186.00
4	Plane 21	Reed	186.00
5	Plane 21	Reed	186.00
6	Plane 21	Reed	186.00
7	Plane 21	Reed	186.00
8	Plane 21	Reed	186.00
9	Plane 21	Reed	186.00
10	Plane 21	Reed	186.00
11	Plane 21	Reed	186.00
12	Plane 21	Reed	186.00
13	Plane 21	Reed	186.00
14	Plane 21	Reed	186.00
15	Plane 21	Reed	186.00

In Portland, a two-day stop, entertainment arrangements were in charge of the Aero Club of Portland, the R. F. Goodrich Rubber Co. and the Standard Oil Company of California. The latter company's representative monoplane joined the touring planes at Yuma, Ariz., and has remained with them since. It carries among others Harvey Campbell, vice-president and secretary of the Detroit Board of Commerce, and Pope Shandor, assistant manager of the tour.

On Tuesday, the day following their arrival in Portland, the tour personnel were given an automobile trip up



Charles Meyer, pilot of Atlantic entry No. 19 and now in fourth place.

the Columbia River highway to Multnomah Falls, and on the return trip stopped at the country estate of John L. Meier, Portland millionaire, for an open air luncheon. The luncheon was sponsored by the R. F. Goodrich Rubber Co.

Leaving Portland behind on the morning of Wednesday, July 18, the planes continued on to Tacoma, Wash., the northernmost of the Pacific coast cities on the 3228 schedule. This leg, 112 mi. by airplane, was made over more of the magnificent mountainous forest lands of the incomparable Northwest. Like the several preceding jumps, however, weather conditions, coupled with the forbidding ruggedness of the country, forced practically all of the planes to deviate from the air base and follow a valley via Carle Rock and Chehalis, approximately 20 mi. west of the air base course. Not again this made little difference, all of the entries maintaining perfect scores over the leg, except two Monocoques, both of which had been delayed on Swan Island. One of the Yale jobs, number 25, had magnets trouble. The other, piloted by Mrs. Gable, managed to take off with it. The leg to

Tacoma affected no change in the standing of the competitors.

Tacoma opened its arms to the Tour personnel with a degree of hospitality experienced nowhere else. After a luncheon at the Windrop hotel a various number of trips to points of interest about the city were placed at the disposal of the flyers. These included a cruise trip in Puget Sound Inn, near the mouth of Mount Tacoma, the highest peak in the United States, a pubbing cruise on Puget



Vance Brown, pilot of the R. F. Mohr entry No. 15 and now in sixth place.

Sound, a trip to the plant of the Boeing aircraft plant at Seattle, a trip through some of the logging camps near Tacoma and an afternoon of recreation at the Tacoma Country Club.

At Tacoma, where the route turned Detroit and the northernmost of the tour legs, 1,751 air line miles of the 6,000 miles of the entire route, had been traversed Twenty-two of the original 25 planes were still in the contest and one of those not present in Tacoma was reported to be checking in and out of the contest points and expecting to regain the certificate in a very day.

Atension, pilot of Monocoque 26, was forced by them to return to Portland shortly after his take off for Tacoma. He was reported to be under a doctor's care and it is not likely he will complete the tour. A total of 20 legs of the tour had been completed when the planes arrived in Tacoma. Out of a possible total of 420 perfect flown plus legs, 329 had been perfectly flown. One plane is not taking into consideration in the landing figures since its leg scores have not been completed at this writing.

At the completion of the twelfth leg the number of perfect scores made by each plane out of the possible total of 20 legs:

Plane number	Score of 100%	Total Perfect Score
1	100%	100%
2	100%	100%
3	100%	100%
4	100%	100%
5	100%	100%
6	100%	100%
7	100%	100%
8	100%	100%
9	100%	100%
10	100%	100%
11	100%	100%
12	100%	100%
13	100%	100%
14	100%	100%
15	100%	100%
16	100%	100%
17	100%	100%
18	100%	100%
19	100%	100%
20	100%	100%
21	100%	100%
22	100%	100%
23	100%	100%
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25	100%	100%
26	100%	100%
27	100%	100%
28	100%	100%
29	100%	100%
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31	100%	100%
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70	100%	100%
71	100%	100%
72	100%	100%
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88	100%	100%
89	100%	100%
90	100%	100%
91	100%	100%
92	100%	100%
93	100%	100%
94	100%	100%
95	100%	100%
96	100%	100%
97	100%	100%
98	100%	100%
99	100%	100%
100	100%	100%

Don't Levy, pilot of the Stearns biplane, number 6, is the only pilot in the tour who has maintained perfect scores over the 20 legs. A number of others who probably would have the same record were late into Springfield, Mo., due to a misconnection of the distance between



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shall stand for quality of the highest order, for a workmanship of the most exacting character, for a fairness in our dealings with you, of a kind that will make our business structure strong and enduring.

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Wichita, Kansas

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that city and St. Louis. When it is realized that the pilots are given credit for their figure of merit when they arrive in a leg serviced within their allotted time, and are penalized when they fail to do so, it can be seen how important is the figure of merit. John P. Wood, pilot of Waco 18, leader of the racers at this writing, for instance, broadens his lead over the Ford plane flown by Haskie, the second high racer, by 51.1 yards each leg, although both have completed the leg in their allotted time. If the same takes Levy, who has flown every leg perfectly as not even "in the money" because his figure of merit is too low.

Because of excessive fog and unsettled weather conditions over the mountains directly between Tacoma and Spokane, next stopping point of the Tour, it was decided to reroute the plane south to Vancouver, thence along the Columbia River Gorge to a point east of Mountain Range after which they could turn northward over the comparatively level lava beds of eastern Washington to Spokane. The change of route was made in the interests of safety since the course east from Tacoma would require approximately 8,000 ft. of altitude or more and is over many miles of narrow-curved, steep and rocky steep slopes covered with unpenetrable timber. In rerouting their route south along the air mail line to Vancouver be-



Ralph Stinson, winner of the 1937 Tour with a Stearman Detourer monoplane.

fore turning east the pilots were allowed a mileage between Tacoma and Spokane of 424 mi., instead of 244 mi., as had been figured. Vancouver was made a useful checking point where all the planes landed, fueled and waited 30 min. before resuming flight.

Because of their gas supply some of the planes found it necessary to land again at Peace for fuel. The Peace stop, however, was not time out as was the case in the Vancouver landing. Despite the lengthened mileage for which additional time allowances were made, all of the contestants except one winged their way across the state of Washington in scheduled time. The one exception was the Curtiss Robin which was delayed by engine trouble.

A non-contesting plane, The Army, in eastern Fokker, piloted by Lieut. Frank B. Tyndall, with Staff Sergeant John Carden as mechanic, and carrying two officers and two passengers, flew the leg from Peace to Tacoma. This flight proved to be the most awe-inspiring of the entire tour.

Over Rainier National Park, Lieutenant Tyndall suddenly disabled his plane and requested fog in dense forest in the plane could not see the wing tips. For about 15 min. we flew high, Lieutenant Tyndall noting the craft would in avoid any possibility of crashing into mountain peaks ahead. Shortly we emerged through the top of the fog and found ourselves seemingly in a new world. We descended along just over the well defined top of the clouds. Finally, and flying directly in the course we had abandoned,

passed the stupor was topped head of Rainier Mountain. In preparation for the 1,000 ft. and 5,000 ft. was the avalanche base of the mountain like a mountainous island over the white waters around which we were flying. The only clouds in the sky above us was the whirling black that hovered at 14,000 ft. girdling Rainier's venerable peak. It is given to few persons to view the loftiest peak in the United States from such a grand angle and it is certain every man in the army ship was as thrilled as was the writer.

In Spokane the planes landed on Falls Field and after a one night stop which included a dinner at the Devonport Hotel they took off Friday, July 20, for Missoula, Mont. Late on the preceding Tour, Messenger Ray Cooper and Referee Ray Cobles had decided it advisable to avoid the mountain between the two cities.

The competing planes were routed over a course between Spokane and Sand Point, Idaho, a city lying approximately 55 mi. southeast of Spokane, thence southward into Montana and along the Clark Fork valley to Missoula. Only two of the 22 planes that started failed to make perfect scores over the 230 mi. route.

"Doc" Robertson and Gould Board took off from Falls Field but were forced to return to adjust trouble. Both pilots arrived in Missoula after the same afternoon. Lieutenant Tyndall again piloted his Fokker over a more or less direct course passing over St. Joe National Park and across the Peter Root Mountain into Clark Fork Valley. Considerable fog was encountered on the flight.

After being celebrated by a "high five" on the banks of the Blackfoot River and a visit to a nearby saw mill, the Tour personnel spent the night in Missoula and departed Saturday morning for Great Falls, where they landed on the Waco Airport.

In going east out of Missoula the pilots, in order to observe lost time by climbing, were compelled to fly through the narrow Blackfoot River Canyon approximately 20 mi. long, then southeast to a checking point five miles north of Helena, and then continue to Great Falls. This course, estimated at 211 mi., was waggled out in preference to the more southerly over the Rockies, which would have necessitated prolonged postponement of the altitude approximating 10,000 ft. With a total score of 19,329 ft., or more than 2,000 points over Frank Harkin, his nearest competitor, John P. Wood was continuing to lead the contestants in Great Falls.

The Sikorsky S-38

(Continued from page 329)

ing. No other structural members are exposed in the cabin except a lateral brace of aluminum which supports the two pilots' seats from the cabin proper and affords a mounting for some of the control devices. Four steps between the rear seats in the cabin lead to a hatchway in the deck where two disintegrating handball struts are provided for support. Two boarding steps are built on the left side of the hull to facilitate embarking and disembarking. The cabin is light and well ventilated despite the fact that the Plexiglas windows on either side are closed in their frames as they cannot be opened, this rendering the heat more severely. Sufficient circulation of air is made possible by opening the transparent Perspex hood in the cabin roof and the two sliding doors at the stern which are made of the same material in the roof of the pilots' compartment. A locker for valuables and other property of the passengers is built in the space under the steps in the rear of the cabin.

The pilots' compartment is roomy and well lighted.

The AIRSEAD



139 m. p. h.

By official test, the fastest
ship in the Reliability Tour

Specifications

Weight Empty	5,000 lbs.
Wing Span	36 ft.
Wing Area	249 sq. ft.
Length	21 ft.
Unfueled Load	1,500 lbs.
Seating Capacity	Pilot and 2 Passengers

Performance

High Speed (Sea Level)	128.1 M.P.H.
Cruising Speed	115 M.P.H.

Power Plant

Engine	Wright
Horsepower	260 at 2,300 R.P.M.
Fuel Capacity	56 gals.
Oil Capacity	9 gals.

Equipment

Scanner, Broken, Metal Propeller, Compass, Air Speed Indicator, Navigation Lights, Tachometer, Altimeter, Clock, First Extinguisher, Fuel, Oil Pressure, and Oil Temperature Gauges, Air Crops, Theaters, Steward and Fuel Valve, Exhaust Manifold, Cabin Heater.

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MARYSVILLE, MICHIGAN

Clear windows in front of the pilot and the Tyndin sliding doors afford excellent visibility ahead and to the sides. Elevator and aileron cables are brought to a control column in the center of the compartment.



Clear up view of the cabin of the S-38 showing the sliding door and section of landing gear.

This column is hinged in the middle so that the upper and bearing the wheel can be swung in front of either seat. Provisions is made to lock it in either position. Dual adjustable rudder pedals are provided and are

hinged at the bottom. Controls for both engines are placed between the seats and behind the wheel which is used to adjust the stabilizer. Both seats are easily adjustable in height by levers at the sides and may be locked in any desired position. The mechanism consists of a rubber cord wrapped in tinned iron attached to each seat and controlled in such a way as to require a minimum of effort for operation. The device works so easily that it is not even necessary for the occupant to take his weight off the seat while raising it.

As the plane is ordinarily flown from the left seat all flight instruments are mounted on the left side of the instrument board which extends about two thirds of the way across the front of the control compartment. Engine instruments are mounted in pairs on the right side of the panel so that the operating conditions of the engines may be easily compared at any given time. Included among the instruments are a Pioneer earth inductor compass, turn and bank indicator and altimeter, Consolidated magnetic compass and air speed indicator, and oil pressure and oil temperature gauges. Below the engine instruments are five switches controlling electric lights over the instruments, in the cabin and pilot's compartments, and the navigation and aileron lights. A selector switch for the single master magneto is also on the board. The door leading to the forward main compartment is at the right of the instrument board.

Usual measures have been employed to decrease fire hazard and no gasoline lines run through the cabin or control compartment. The engine is fed by gravity from two 30 gal. fuel tanks built of heavy riveted aluminum and placed close together in the outer sec-

AVIATION July 26, 1938

AVIATION July 26, 1938

tion of the upper wing. All fuel lines are exposed so as to be easily accessible for replacement or repair. A special cross feeding valve controlled from the pilot's compartment, makes it possible to supply either engine from either tank. Valves to shut off the supply of gasoline at the carburetors are also installed from the cabin. Either or both tanks may be emptied in less than one minute through a five inch dump valve by pulling emergency handles on collared covered boxes within easy reach of the pilot. Large sea gage gauges in the lower surface of the wing are easily available from the control compartment.

Heat treated duralumin shapes are riveted together to form the engine mountings, which are supported by struts from the upper wing spars. The nacelles are well streamlined and built with louvers at the sides and a hole in the back to provide air circulation. 70 tanks, located behind the engines, are of the same



Rear view of the Stearman S-38.

construction as the gasoline tanks. All tanks are reinforced on the inside and equipped with large escape. Each power seat includes the engine with an Eclipser head twin starter and a Standard Steel two blade adjustable propeller. The airmen are easily disconnected for replacement or repair. Flights are free to disconnect and tachometers, both having luminous dials, are mounted in the nacelles in view of the pilot. A streamlined dashboard control rod housing connects the two nacelles. It is pivoted at the center by a similar vertical housing which contains all control rods and cables from the pilot's compartment. No rods, cables, and other vital parts of the plane are in the plane of propeller rotation.

One of the outstanding features of the S-38 is its most retractable landing gear which has been developed after a great deal of experimentation by engineers of the Stearman Company. The retracting mechanism is entirely hydraulic while that of shock absorbing is a combination of oil and spring. Wheels may be extended simultaneously or separately, each having its own distinct retracting mechanism.

Each wheel is supported by two radius struts terminating in the axle and hinged at the other ends to the tail with a strengthening member connecting them at the points where they are hinged. With this dual member as an axle the wheel may be retracted from its normal position on the ground to its retracted position flat against the outer surface of the lower wing with the center pin in front of the leading edge. Hinged loosely to the outside end of the axle is a steel tube having at the upper end an integral piston which acts in a long cylinder suspended from the engine mounting. When oil is pumped into the cylinder at the bottom the piston is forced upward driving with it the sliding tube to which the axle is hinged. Then the wheel is retracted. The reverse process takes place

When he levels off...
will the crowd rush
onto the field... into danger?

TRAGEDY stalks the airport where spectators stampede at will. Menaced by enthusiasm people will rush into the path of a roaring ship... surrounded by a flaming propeller lying through the air... forgetful that the pilot may crash in an attempt to avoid them.

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Effective restraint of the most enthusiastic throng is provided by an Anchor Chain Link Fence. Posts and gates are the strongest made. Drive-Anchorage holds the fence firm and true. Square Terminal Posts add to the attractiveness of the enclosure. These are exclusive features found in an Anchor Fence of every height and type. Have the local Anchor Fencing Specialist explain them... his experience and trained operators are at your command.

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RIDING at a buoy in a Summer Resort, ready to start on a summer's notice, the Stearman Seaplane clearly illustrates the advantages of Seaplane operation. Five minutes in a new boat, or two minutes in a motor boat take you from the shore behind the Seaplane. Upon the morning rise, take the craft and off you go anywhere within 490 miles radius.

From the new summer resort you would have to motor an hour to get to the nearest flying field. An hour as crowded days ends on a hot Summer day! And then you have to think about the dangers of forced



landings, to worry about the place to land, to worry about getting to your destination from the place you will land in.

There are no such worries while flying a Seaplane. There is always a level surface of water under you, to land in case of engine trouble. There are plenty of excellent harbors along Seacoasts, on the lakes and on the rivers. From cross coastal people

could now want, and now even of the large cities are found to be as even, lake or harbor. You can hardly imagine a Summer Resort without water. And everywhere, where there is water, you can fly in a Seaplane.



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CORPUS POINT, L. I., N. Y.

STANDARDIZED ALL METAL SEAPLANE FLOATS

WRITE FOR INFORMATION TODAY

Displacement of second nose watertight compartment	6,300 lb.
Displacement of first watertight compartment under floor	2,800 lb.
Displacement of second watertight compartment under floor	1,000 lb.
Displacement of Stern watertight compartment	1,000 lb.
Distribution of Load	
180 gal. gasoline	1,080 lb.
12 gal. oil	90 lb.
Pilot	170 lb.
5 passengers	1,350 lb.
Equipment	120 lb.
Total Useful Load	3,000 lb.
Weight of Plane Empty	3,000 lb.
Gross Weight	6,000 lb.
Load Factors	
High Incidence	5.5
Low Incidence	3.0
Inverted Flight	2.2
Nose Dive	2.0
Available Cargo Capacity	
Passenger seats	175 cu. ft.
Forward Mail Compartment	80 cu. ft.
Total	255 cu. ft.
Performance	
High Speed (1900 r.p.m.)	124.5 m.p.h.
Cruising Speed (1650 r.p.m.)	110 m.p.h.
Landing Speed	52 m.p.h.
Initial Climb at Sea Level	1000 f.p.m.
Service Ceiling	20,000 ft.
Time to take off with full load on land	7.5 sec.
Time to take off with full load on water	14 sec.

The Bird Biplane

(Continued from page 330)

solid, rectangular section spruce spars and the dorp box type compression ribs. These compression ribs have a flat spruce member at the top and the bottom and a plywood web on only one side. The top strips are braced by three small blocks placed vertically between them and attached



The Bird Biplane taking off.

to the web. The ribs are of the true type between the spars and employ spruce members and plywood gosses at the joints. The leading edge and the trailing edge are reinforced with a plywood web on one side. The web for the leading edge is aligned with a single round hole, but that for the trailing edge is solid, with no lightening holes. The leading edge is reinforced with a covering of sheet duralumin. Fiberglass is used for covering and is protected with dope and varnish in the usual manner.

The external wires are stretched to the rods made by Stewart Harbinger, while the internal tie rods are of round section of the same galvanneal.

The wings are of constant chord to a point approximately one foot from the tip, where there is a gradual rounding, giving the entire wing a tapered appearance. It is claimed that this cuts down the resistance appreciably and also increases the efficiency of the ailerons. The ailerons taper chord, having the widest section at a point in the middle. It is stated that this makes the wings operate efficiently. They are differentially controlled, having an upward motion of 25 deg. and a downward motion of 20 deg. The aft ailerons are of welded tube construction covered with fabric. The elevators are controlled by push-pull rods connected in the upper wing connection to the cockpit. These bell cranks by vertical members between the fuselage and the upper wing. The elevator is also controlled by push rods, while the rudder is actuated by cables. The horizontal stabilizer is adjustable from the rear cockpit only.



Front quarter view of the Bird Biplane fitted with an OX-5 engine.

The fuselage is rectangular in section faired with wood members and covered with fabric. It is stated that by careful sanitation and by the use of chrome molybdenum could taking the weight of the fuselage has been kept down to 70 lb. All structural steel tubing is spot welded in the form of a modified Warren truss, with no wire bracing. The fuselage is constructed in a heavy jig of steel channels and angles welded in place, producing a perfectly aligned and interchangeable fuselage. On the front is a detachable engine mount also of steel tubing. At the bottom is a hinged type radiator which is built as an integral part of the engine mount and connected inside the cowling. It is faired into the lines of the fuselage and is said to cut down the head resistance appreciably. At the rear of the engine section is an aluminum fire wall and a 40 gal. propane tank. The front cockpit is wide enough for two people and is fitted with complete controls, so that the plane may be flown from either seat. An outstanding aerodynamic design feature emphasizes perfect flight balance, which allows the passengers' cockpit to be unoccupied and requiring no stickover adjustment.

The stick in the front cockpit is removable when dual control is not desired. In both cockpits the throttle control is provided on both sides in standard equipment. Standard instruments grouped together in one panel are provided in the rear cockpit. The vision from either cockpit, especially that from the rear one, is exceptionally good. From the rear or pilot's seat one can easily see the wheels and ground when landing because of the narrow chord and the great stagger (30 deg.) at the lower wing. Behind the rear cockpit is the wing level deck is a compartment for baggage. Above this is a fitting for the

—on the wings of record breakers



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THE sturdy Monocoupe with approved type certificate No. 22, issued by the U. S. Department of Commerce, is rapidly gaining public favor.

Its takeoff in less than 100 feet, climb, speed, ease of control, economy and ability to get in and out of small fields, make it the ideal coupe of the air.

Powered by the famous Veece radial aircraft engine, (U. S. Department of Commerce official certificate No. 4) the Monocoupe turns out 20 miles for each gallon of gas, cruises

at 85, or does 100 miles per hour wide out.

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Safer!

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Tighten the lock nut as much as you will—you cannot hurt the terminal or break the tie rod. Now, stronger, safer, better. Look out screws on to the terminal instead of on to the rod, avoiding torsional and tensile strains, giving closest thread fit. Write for detailed information. MacWhythe Company, 2915 Fourteenth Avenue, Kenosha, Wisconsin.

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A well-known aircraft manufacturing firm
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He must be thoroughly familiar with the
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He must be a man whose experience and
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and operating a sales organization,
capable of handling a million dollars' worth
of business. He must have a minimum
of three years' experience in this position.
He must have a minimum of three years' experience
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If you are such a man, write at once, giving
full details about yourself, and send a
resume. Here the minimum
has been set which will be considered
as a minimum. Your correspondence will be
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Chicago

plot's head which is used to increase the speed of the plane.
The landing gear is of divided type and similar to that
used on many military designs. Each wheel is braced
with a member to each of the lower longons and an additional
member containing the oleo and rubber shock absorber
attached to the longons on the same side as the wheel.
This construction makes it necessary for two of the
lower members to cross and this was efficiently ac-
complished by providing an elliptical opening in one member
through which the other passes, thus allowing independent
action of each other. The road is 5 ft. 6 in. and
ties 26 in. by 4 in. are used. It is stated that the design
is such that when the shock absorbers are compressed, the
wheels move outward and forward, tending to prevent
steering over. The tail skid is of the steel spring type
mounted on a swivel. The bracing around the rear part
of the fuselage has extra gusset plates.

It is understood that the Bird before will sell for ap-
proximately \$3,500 when powered with an 80 hp. Anzani
engine, and \$3,150 using an OX-5 engine. Without en-
gine the price is in the neighborhood of \$2,800.

Specifications as submitted by the manufacturer are as
follows:

Length over all.....22 ft. 3 in.
Height over all.....8 ft. 8 in.
Span—upper wing.....34 ft.
Span—lower wing.....25 ft.
Chord—upper wing.....69 in.
Chord—lower wing.....48 in.
Area—upper wing.....184 sq. ft.
Area—lower wing.....82 sq. ft.
Total wing area.....266 sq. ft.
Airfoil.....U. S. A. 40-B Modified
Horizontal tail surface.....35 sq. ft.
Vertical tail surface.....12 sq. ft.
Tread of the landing gear.....5 ft. 6 in.
Weight empty.....550 lb.
Disposable load.....800 lb.
Gross weight.....1,350 lb.
Power plant.....Curtis OX-5, 90 hp.
Wing loading.....5.99 lb./sq. ft.
Power loading.....25.44 lb./to hp.
High speed.....108 m.p.h.
Cruising speed.....80 m.p.h.
Landing speed.....37 m.p.h.
Take off run.....100 ft.
Climb at sea level.....200 ft./min.
Climb at 20,000 ft.....400 ft./min.
Service ceiling.....15,500 ft.
Absolute ceiling.....18,000 ft.
Gasoline consumption at 80 m.p.h.....15 gal./hr.
Gasoline capacity.....40 gal.
Endurance at cruising speed.....3 hr.

Keystone Production

(Continued from page 327)

As heretofore mentioned, our main building, 1,000 ft.
x 100 ft., is divided lengthwise by an aisle marked out on
the floor, and no machinery or parts are allowed to go
in this aisle.

This divides the factory into two distinct divisions.
On one side there is a progressive assembly line of wood
frames, fuselages, metal structures and sub-assemblies,
covering and tank installations, fuelage and equipment
and equipment assemblies, and then the final assembly and
the shipping floor on the opposite side of the aisle. Be-
ginning opposite the wood surface assembly, fuselage

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AVIATION
July 28, 1938

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A Keystone bomber in the process of being assembled in the factory.

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We feel that the N. A. A. Chapter is an excellent club for an aircraft factory. Beside promoting athletics they have many social functions that are enjoyed by all employees, whether members of the Chapter or not.

Such employees as these rightfully deserve all the encouragement within reason for the furtherance of such cooperation, loyalty, and welfare, and every effort of Keystone is ready to stand behind them.

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